
-- BACKGROUND OF THE INVENTION

1. Technical Field.

9, The present invention relates to a method and apparatus for regulating the distribution of gaseous fluids and in particular to a mixing, aerating or oxygenating method and apparatus to aerate or oxygenate ponds, rivers, estuaries, reservoirs or lakes, sewage or effluent treatment lagoons or beds or tanks or to airstrip volatile compounds from water or other solutes.

2. Description of the Background Art. --

Replace the paragraph beginning at page 1, line 20 with the following rewritten paragraph:

92 -- In the known systems, a plurality of diffusers are fed from a supply line, usually from a suitable air source such as an air pump, which delivers a constant and even supply of air. The diffusers are disposed in series along the supply line and the quantity of air emerging from each diffuser is intended to be substantially the same. In the known sewage treatment systems, potential pressure drop along the line from one diffuser to the next is rendered negligible by utilizing a supply pipe having a large cross-sectional area and a relatively low-pressure supply. The cross-section of the pipe has to be calculated having regard

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cont. to the number of diffusers and the discharge rate in order to ensure that there is a negligible pressure drop along the length of the pipe and thereby ensure that the flow from the diffusers is balanced. In other specific aeration systems a manually adjustable valve or orifice control may be provided for each diffuser to balance their output. The known system of individually balanced gas diffusers is difficult to set up to ensure correct balance, usually requiring accurate levelling of the outlet diffusers. --

Replace the paragraph beginning at page 2, line 9, with the following rewritten paragraph and heading:

C13 -- A constant flow regulator and a method of manufacturing same comprising a moving "O" ring is described in Patent Nos. EP 115342 and GB 2136713. The described regulator gives a constant through volume flow rate of liquid over a wide range of supply pressures. A regulator of this type can be designed to produce a specific flow rate over a prescribed pressure range and can be molded from plastics which makes them extremely economical to produce. When a plurality of such constant flow devices are fitted in series in a pipeline supplied with liquid at a sufficiently high pressure, the flow rate is constant from each regulated line irrespective of the pressure fluctuations along the pipeline(s) of the system. The supply line pressure has to

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be above a predetermined minimum level at the point where the pressure drop is highest. Usually this will be at the end of the pipeline. The use of these devices has not been considered to regulate the flow of air or oxygen. There is no teaching to use these devices with fluids other than liquids. The reason for this may be that none of the commercially available devices have been deemed able to operate to produce constant flow with fluctuating air pressure.

SUMMARY OF THE INVENTION --.

Replace the paragraph beginning at page 3, line 8 with the following rewritten paragraph:

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-- More particularly, the present invention provides a method of mixing, aerating or oxygenating ponds, rivers or lakes, sewage/treatment lagoons or effluent beds or air stripping volatile compounds from water or other solutes, the method comprising distributing air or oxygen through a pipe system having a plurality of outlet lines branching from a common supply line or manifold, by continuously generating a predetermined minimum volume of air or oxygen and introducing it into the pipe system, delivering a desired quantity of the air or oxygen at each of the outlets by providing a constant flow regulator means in each outlet line which limits the flow to a set amount when

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cont. the pressur in the pipe system exceeds a predetermined minimum value. --

Replace the paragraph beginning at page 4, line 1 with the following rewritten paragraph:

95 -- Another aspect of the present invention provides a gas distribution system comprising a gas distribution supply line, a source of gas pressure connected to the distribution supply line, and a plurality of outlet lines branching from the distribution supply line, and characterized by a constant flow regulator disposed between the distribution supply line and each outlet line to cause a desired flow of gas to be delivered through the outlet lines. --

Replace the paragraph beginning at page 4, line 7 with the following rewritten paragraph:

96 -- More particularly, the present invention provides a mixing, aeration or oxygenation system to aerate or oxygenate ponds, rivers, estuaries, reservoirs or lakes, sewage or effluent treatment lagoons or beds or to airstrip volatile compounds from water or other solutes and comprising an air or oxygen distribution supply line, a source of pressurized air or oxygen connected to the distribution supply line, and a plurality of

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cont. outlet lines branching from the distribution supply line, and characterized by a constant flow regulator disposed in each outlet line to cause a desired flow of air or oxygen to be delivered through the outlet lines. --

Replace the paragraph beginning at page 5, line 8 with the following rewritten paragraph:

97 -- Each outlet has a suitable outlet nozzle. They may be aeration nozzles, diffusers or any other suitable nozzle for the intended application. In a preferred application each outlet supplies a respective diffuser. Conveniently the outlets are disposed in series along the distribution supply line. The number of outlets and hence outlet nozzles/diffusers are calculated and spaced according to the particular application. Preferably the gas originates from a suitable source, usually generated by a pump gas blower or generator or other suitable device, and preferably it delivers a constant volume of gas. The system can be used for distributing any desired gas composition. For many applications, the gas will be air but other gases could be used such as oxygen, carbon dioxide, nitrogen or ozone. The distribution supply line comprises at least one length of pipe. As an alternative it may comprise a plurality of lengths of pipe branching from a common manifold or having a direct connection with the supply of gas. The pipeline may include a r turn line

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or be of ring main type. The outlet lines may incorporate a backflow regulation device and/or an isolation ball valve. Such devices may incorporate the aforesaid constant flow regulator or be provided as separate devices. The constant flow regulator, any backflow regulation device and any isolation valve may be combined with an outlet diffuser. --

Replace the paragraph beginning at page 6, line 10 with the following rewritten paragraph:

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-- For any given application the delivery rate from the outlets will be known and the source of gas will be capable of maintaining a constant supply of no less than the calculated minimum requirement for the system. --

On page 6, between lines 15 and 16, insert the following heading:

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-- BRIEF DESCRIPTION OF THE DRAWING --.

Replace the paragraph beginning at page 6, line 21 with the following rewritten paragraph and heading:

-- DETAILED DESCRIPTION OF THE INVENTION

For convenience the present invention is described by way of example in relation to the treatment of water by the injection of air. In one application for waste treatment, the water will contain effluent. The water/effluent to be treated is shown at 1a and held within an open well or receiver 3. An air distribution pipeline 2 extends from a source of air 1b which supplies the air under pressure to the pipeline 2. A motor driven pump (not illustrated) conveniently serves this purpose. The pipeline 2 has a plurality of outlets 4 disposed along the length thereof at spaced intervals. For the purpose of effluent treatment, each outlet 4 is provided with a diffuser which releases the air into the water/effluent 1a in the form of small bubbles. In order to ensure that the flow of air from each diffuser is the same, a regulator 5 is incorporated into the flow line between the pipeline 2 and each of the outlets 4. The regulator 5 may be part of the diffuser or a separate component. The regulator 5 is designed to deliver a constant flow irrespective of pressure variations in the pipeline 2 when the pressure in the pipeline 2 exceeds a predetermined minimum value, which minimum value is calculated to be that which will ensure that each regulator 5 supplies the desired volume of gas. The preferred regulator device is of a type known as a moving element constant flow regulator such as described in the above mentioned patents. These are very economical to produce, especially when molded from plastics. --

Replace the paragraph beginning at page 7, line 14, with the following rewritten paragraph:

Q11 -- The preferred moving element constant flow regulator is designed to operate to deliver a desired flow of air over a range of supply pressures. That is to say it is self-compensating for changes in supply pressure over a prescribed range of pressures above a minimum pressure level. Figure 2 is a graph of a regulator of moving element type having characteristics of the described type and shows flow volume against pressure. It shows how the flow rate plateaus after pressure P1. Using a plurality of flow regulators 5 in a distribution supply line will give rise to an even delivery of air from the plurality of diffusers providing the pressure in the pipeline exceeds the minimum threshold value P1. --

In the claims:

On page 9, line 1, change "Claims" to -- What is claimed is: --.

Cancel all existing claims. Add the following new claims.

21. (New) A method of mixing, aerating or oxygenating ponds, Q12 rivers or lakes, sewage/treatment lagoons or effluent beds or air